

Patent Claims

1. A light-emitting semiconductor component comprising a monolithically produced sequence of semiconductor layers (2), wherein an area of n-doped semiconductor layers (3) and an area of p-doped semiconductor layers (4) follow one another and a first pn junction (5a, 5b) is formed between the areas (3, 4), wherein the first pn junction (5a, 5b) is subdivided into a light-emitting section (7) and a protective-diode section (8) by an insulating section (6), characterized in that
- the insulating section (6) electrically insulates the light-emitting section (7) and the protective-diode section (8) from one another in the area of the p-doped semiconductor layers (4),
 - the area of the p-doped semiconductor layers (4) is provided in the protective-diode section (8) on the side facing away from the first pn junction (5b) with an n-doped semiconductor layer (9) which forms a second pn junction (10) with the area of p-doped semiconductor layers (4) in the protective-diode section (8) and is electrically conductively connected to the area of p-doped semiconductor layers (4) in the light-emitting section (7), and
 - the first pn junction (5a, 5b) has a larger area in the protective-diode section (8) than in the light-emitting section (7).
2. The light-emitting semiconductor component as claimed in claim 1, characterized in that the area of the first pn junction (5a, 5b) is larger in the protective-diode section (8) than in the light-emitting section (7) by at least a factor of 100.
3. The light-emitting semiconductor component as claimed in claim 1 or 2, characterized in that the sequence of semiconductor layers (2) is applied to a semiconductor substrate (1).

4. The light-emitting semiconductor component as claimed in claim 3, characterized in that a first contact metallization (11) is applied to a side of the semiconductor substrate (1) facing away from the sequence of semiconductor layers (2) and a second contact metallization (12) is applied to part-areas of a surface of the sequence of semiconductor layers (2) opposite to the semiconductor substrate (1).
5. The light-emitting semiconductor component as claimed in one of the preceding claims, characterized in that the area of n-doped semiconductor layers (3) is not interrupted by the insulating section (6) at least in parts.
6. The light-emitting semiconductor component as claimed in claim 3 or as claimed in one of claims 4 or 5, with reference to claim 3, characterized in that the insulating section (6) extends from a surface of the sequence of semiconductor layers (2) opposite to the semiconductor substrate (1) into the area of n-doped layers (3).
7. The light-emitting semiconductor component as claimed in one of the preceding claims, characterized in that the light-emitting section (7) is formed by a vertical cavity surface emitting laser (VCSEL).
8. The light-emitting semiconductor component as claimed in claim 7, characterized in that the first pn junction (5a, 5b) is arranged between a first sequence of Bragg reflector layers and a second sequence of Bragg reflector layers, each of which has a multiplicity of layer pairs, and the two sequences of Bragg reflector layers form a laser resonator, one of the two sequences of the Bragg reflector layers being semitransparent for the laser radiation (18) generated in the pn junction (5a).

9. The light-emitting semiconductor component as claimed in claim 8, characterized in that in one of the two sequences of Bragg reflector layers, at least one
5 current aperture (14) is provided for spatially limiting an operating current flowing through the first pn junction (5a) in the light-emitting section (7) during the operation of the vertical cavity surface emitting laser.
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10. The light-emitting semiconductor component as claimed in claim 4 or as claimed in one of claims 5 to 9, with reference to claim 4, characterized in that the second contact metallization (12) partially covers the
15 surface of the light-emitting section in such a manner that an uncovered area remains as light exit opening (17).
11. The light-emitting semiconductor component as
20 claimed in one of the preceding claims, characterized in that the insulating section (6) is constructed as trench (19).
12. The light-emitting semiconductor component as
25 claimed in claim 11, characterized in that the light-emitting section (7) and the protective-diode section (8) have a mesa-shaped structure on the side of the trench (19).
- 30 13. The light-emitting semiconductor component as claimed in claim 11 or 12, characterized in that the trench (19) is bounded by areas which are provided with an insulating layer (16).
- 35 14. The light-emitting semiconductor component as claimed in claim 13, characterized in that the trench (19) is filled with a material from which the second contact metallization (12) is formed.

15. The light-emitting semiconductor component as claimed in one of claims 1 to 10, characterized in that the insulating section (6) is formed by an implantation, diffusion or oxidation process.

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16. The light-emitting semiconductor component as claimed in one of the preceding claims, characterized in that n doping and p doping of the semiconductor layers are exchanged for one another.